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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/803,847	03/18/2004	Guangming Xiao	67493/121 (6758.2-1)	6418
1912 7590 12/20/2006 AMSTER, ROTHSTEIN & EBENSTEIN LLP 90 PARK AVENUE NEW YORK, NY 10016			EXAMINER ROSASCO, STEPHEN D	
			ART UNIT 1756	PAPER NUMBER
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		12/20/2006	PAPER	

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/803,847

Applicant(s)

XIAO, GUANGMING

Examiner

Stephen Rosasco

Art Unit

1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 November 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) 9-15 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 16-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 3/18/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

Detailed Action

Applicant's election without traverse of Group I (claims 1-8 and 16-28) in the reply filed on 11/09/06 is acknowledged.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 4-8, 16-18 and 24-28 are rejected under 35 U.S.C. 102(e) as being anticipated by Babcock et al. (6,902,851) or Cummings (7,022,436).

The claimed invention is directed to an embedded attenuated phase shift photomask and a method of making, the method comprising: completely removing in first regions of the photomask the phase shift layer; removing to a predetermined depth in the first region the substrate underlying the removed first regions of the phase shift layer; and thinning in second regions of the photomask the phase shift layer to achieve a predetermined attenuation for radiation passing through the second regions, whereby the relative phase shift between radiation passing through first regions and the second regions is equal to a desired phase shift.

Babcock et al. teach (see claims) claims 1, 4-8, 16-18 and 24-28.

Babcock et al. teach an embedded attenuating phase-shift mask, in which the opaque material allows a small percentage of the light (e.g., 4-8%) at a given wavelength to

Art Unit: 1756

be transmitted and, as a result of the light passing through the opaque material, the phase is changed by 180 degrees.

Babcock et al. also teach (col. 5, lines 30-45) multiple etch steps to produce trenches 58 which include a plurality of trenches 52 which are exposed during this second etch, trenches 52 being etched to a further depth during this second etch step. Trenches 52 are etched to increase the depth of the phase-shifting trenches to a depth suitable for phase-shifting of the longer wavelength. If a chrome layer is in place on surface 44, no further masking may be required, since the chrome layer will act as a hard mask. Alternatively, if no chrome is in place on second region 38, a second mask may further be required to perform the second etch step on trenches 52.

Cummings teaches (see claims and col. 10, lines 35-65) Referring again to FIG. 12...

The depth D that each feature 531, 532 is etched to produce the desired phase shift is inversely linearly related to the difference, $\Delta n = n_{\text{sub.510}} - n_{\text{sub.550}}$, between the indices of refraction of the glass or quartz layer 510 and the fill material 550, and the difference, $\Delta k = k_{\text{sub.510}} - k_{\text{sub.550}}$, in the dielectric constants of the glass or quartz layer 510 and the fill material 550. As the differences Δn and Δk increase, the depth D to which the features 531 and 532 must be etched to produce the desired phase shift decreases. Conversely, as the differences Δn and Δk decrease, the depth D to which the features 531, 532 must be etched to produce the desired phase shift increases. As discussed above, phase shifts of 180 degree are desired for alternating phase shift masks and phase shifts of less than 180 degree are desired for attenuating phase shift masks.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2, 3 and 19-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Babcock et al. (6,902,851) or Cummings (7,022,436) in view of Xiao (6,472,766).

The claimed invention is directed to an embedded attenuated phase shift photomask and a method of making, the method comprising: completely removing in first regions of the photomask the phase shift layer; removing to a predetermined depth in the first region the substrate underlying the removed first regions of the phase shift layer; and thinning in second regions of the photomask the phase shift layer to achieve a predetermined attenuation for radiation passing through the second regions, whereby the relative phase shift between radiation passing through first regions and the second regions is equal to a desired phase shift.

Babcock et al. or Cummings are included here as discussed above.

The teachings of Babcock et al. or Cummings differ from those of the applicant in that the applicant teaches that a single photomask has formed on it a plurality of test cells, each with potentially different phase shifting conditions, such as a different transmission, phase shifting angle, and tri-tone.

Xiao teaches (col. 6, line 21+) A second more simplified method for creating a step mask is illustrated by the flow chart of FIG. 5. In general, this method proceeds on a test cell-by-test cell basis and is therefore less efficient than the method set forth above. In this

Art Unit: 1756


embodiment test cells are identified or numbered individually from 1 to N. After the mask has been written, developed, and Cr etched, the MoSi phase shifter material may be etched to a predetermined step height 58 thereby narrowing the range of phase shift.

It would have been obvious to one having ordinary skill in the art to take the teachings of Babcock et al. or Cummings and combine them with the teachings of Xiao, which teaches the use of regions of the mask for test cells in order to make the claimed invention because the method for patterning of the mask is the same and it would have been obvious if so desired to incorporate the test cells of Xiao in the prior art mask.

Conclusion

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Stephen Rosasco whose telephone number is (571) 272-1389. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. The Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'S. Rosasco', with a long horizontal line extending to the right.

S. Rosasco
Primary Examiner
Art Unit 1756

S. Rosasco
12/14/06